GPM DPR 2AKu v5 Rain Types

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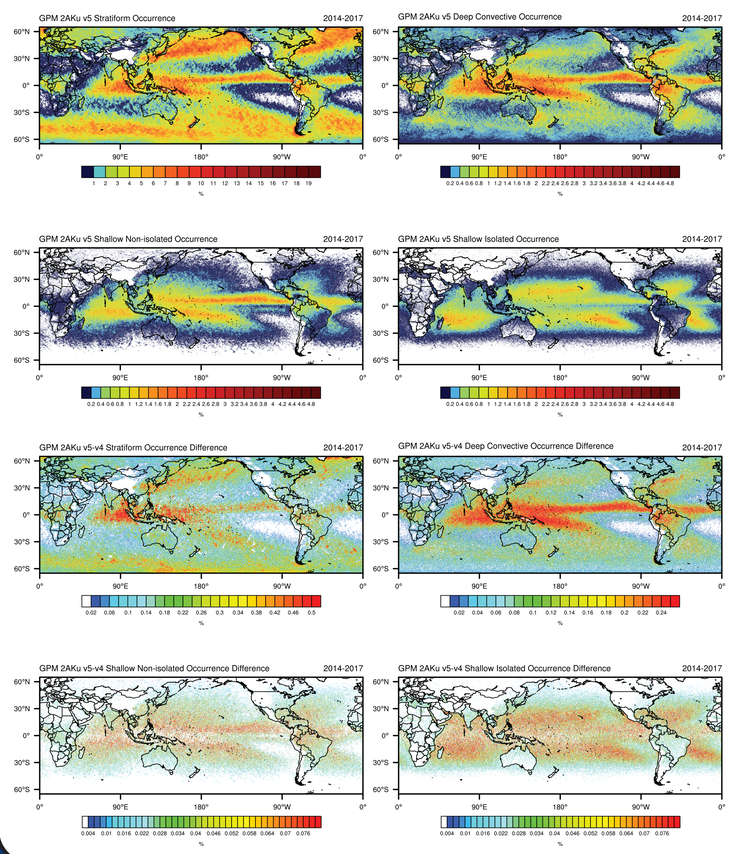
Introduction

GPM 2AKu radar rain type data were reprocessed utilizing version 5. A primary change to the DPR v5 data was is the application of a +1.1 dB radar calibration offset. The updated calibration results in an overall increase in the number of rain retrievals from 14 to 60 dBZ and an overall increase rainfall volume. TRMM v7 and GPM 2AKu v4 and v5 rainfall statistics are compared in this study using binned Ku-band reflectivity retrievals of four major rain types (stratiform, deep convective, shallow non-isolated, and shallow isolated). Estimates of rain rates are calculated by applying fixed Z-R relationships for stratiform and convective rainfall at the 2 km level.

Ku-band v4/v5 Rain Type Occurrence

The application of the new Ku-band calibration offset has resulted in an increased number of retrievals with 2km reflectivity between 14 and 60 dBZ. Increases in occurrence are less than 1% with he largest increases are seen in the tropics.



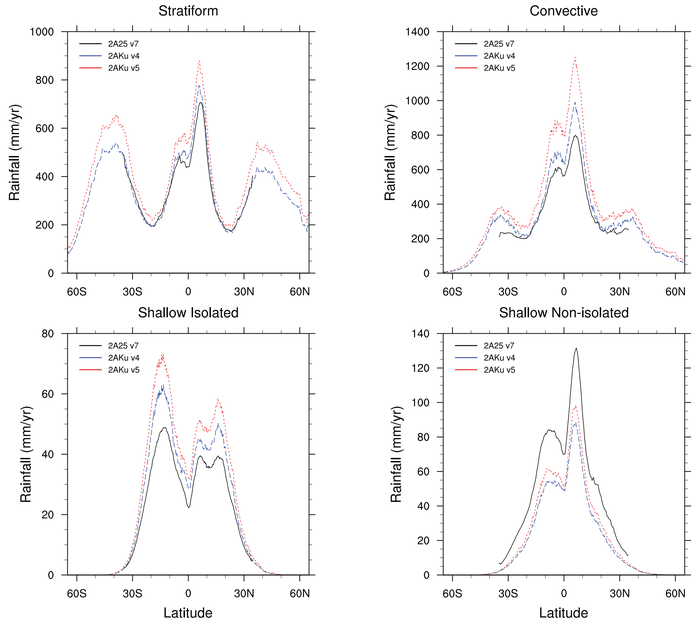
2AKu v4/v5 Rain Type Changes

v4 Convective to v5 Stratiform		
Latitude	% Modified	% of v4 Total Rain
40N-60N	9.40%	-0.16%
20N-40N	6.10%	-0.11%
0-20N	2.60%	-0.07%
20S-0	2.50%	-0.06%
40S-20S	7.40%	-0.09%
60S-40S	10.50%	-0.16%
60S-60N	**5.72%**	**-0.10%**

v4 Stratiform to v5 Convective		
Latitude	% Modified	% of v4 Total Rain
40N-60N	1.60%	2.18%
20N-40N	3.10%	2.46%
0-20N	4.90%	2.82%
20S-0	4.70%	2.77%
40S-20S	2.70%	2.29%
60S-40S	1.30%	2.04%
60S-60N	**2.62%**	**2.52%**

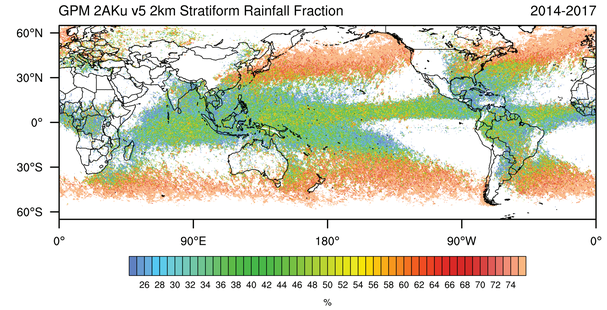
Changes in rain type from convective to stratiform and vice versa occurred between v4 and v5. More v4 convective retrievals were modified to stratiform at higher latitudes for v5 than in the tropics, while the opposite is true for stratiform to convective type modifications. No significant change in rainfall resulted from the change from convective to stratiform, but the change from stratiform to convective resulted in an increase in rainfall from 2-3% at all latitudes. Rain type changes from v4 to v5 are partly due to the change in the radar calibration offset. The change in rainfall amounts can also be attributed to the new calibration offset as well as the difference in the fixed Z-R relations used for this study.

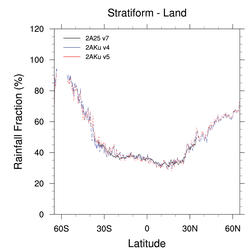
TRMM/GPM Zonal Mean Rainfall



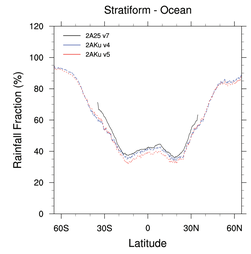
- GPM 2AKu v5 rainfall is greater than v4 at all latitudes. This is likely due to the v5 calibration offset of ~1.1 dB.
- Peak 2AKu v5 convective rainfall increases 26% compared to 2AKu v4 and increases 56% compared to TRMM 2A25 v7.
- Shallow non-isolated rainfall is greater in TRMM 2A25 data than 2AKu v4 or v5 because of recategorization.

Stratiform Rain Fraction



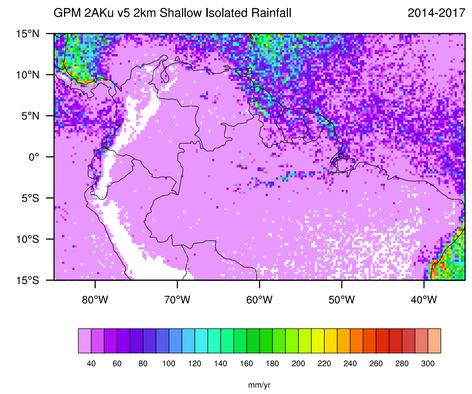


- TRMM 2A25 1998-2013 stratiform rainf fractions over land are similar to GPM 2AK v4 and v5 2014-2017



- 2AKu v5 stratiform rainfall fractions have decreased over tropical latitudes compared to v4
- 2A25 v7 stratiform rain fractions are greater overall than 2AKu v5 with a peak difference of ~5%

Shallow Isolated in the Amazon



The Amazon river basin is visible in shallow isolated rainfall data owing to a very small number of retrievals with much higher reflectivity values at the 2 km than near-surface. The data is likely noise that can be removed by the user.

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